

CLAIMS

What is claimed is:

1. An apparatus, comprising:
a vehicle; and
5 a control system located in the vehicle, the control system comprising:
a processor,
a wake-up circuit coupled to the processor;
a program utilized by the processor during a standby mode of operation,
the program configured to:
10 provide a voltage to the wake-up circuit for a first time period
once an interrupt is received by the processor;
monitor the wake-up circuit for a second time period; and
recalibrate the wake-up circuit if a response of the wake-up
circuit exceeds at least one predetermined limit.
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2. The apparatus, as set forth in claim 1, wherein the control system
comprises a remote keyless entry system.
3. The apparatus, as set forth in claim 2, wherein the control system
20 comprises a lock actuator in communication with the processor, wherein the lock
actuator is configured to engage and disengage a door lock.

4. The apparatus, as set forth in claim 3, wherein the remote keyless entry system comprises a transceiver module that is coupled to the processor and adapted to receive a signal from a transmitter to activate the lock actuator to unlock the door lock.

5 5. The apparatus, as set forth in claim 1, wherein the control system comprises a window system.

6. The apparatus, as set forth in claim 5, wherein the window system comprises a motor coupled to the processor and a window, wherein the motor moves
10 the window.

7. An automotive control system, comprising:
a microprocessor,
a wake-up circuit coupled to the microprocessor;
15 a memory coupled to the microprocessor;
a program within the memory and utilized by the microprocessor, the program configured to:

apply a voltage to the wake-up circuit for a first time period;
measure a response of the wake-up circuit for a second time period;
20 determine if the response is within a predetermined limit; and
recalibrate one of the voltage and the first time period if the response is
not within the predetermined limit.

8. The automotive control system, as set forth in claim 7, wherein the program accesses a plurality of stored parameters to determine the voltage and the first time period.
- 5 9. The automotive control system, as set forth in claim 8, wherein the plurality of stored parameters are stored in the memory.
- 10 10. The automotive control system, as set forth in claim 7, wherein the recalibration of the one of the voltage and the first time period updates at least one of a plurality of stored parameters.
- 15 11. The automotive control system, as set forth in claim 7, wherein the microprocessor comprises a first port and a second port coupled to the wake-up circuit; and wherein the voltage is provided to the wake-up circuit through the first port and the response is measured from the first port.
- 20 12. The automotive control system, as set forth in claim 7, wherein the wake-up circuit comprises:
a first resistor having a first terminal and a second terminal, wherein the first terminal is coupled to ground;
a second resistor having a third terminal coupled to the second terminal at a node and a fourth terminal coupled to the first port; and

a capacitor having a fifth terminal coupled to each of the second terminal, the third terminal, and the second port and a sixth terminal coupled to ground.

13. A computer program that is stored on one of more tangible mediums for
5 operating and recalibrating a wake-up circuit, the program comprising:

a routine for applying a voltage to a wake-up circuit for a first time period in response to an interrupt;

a routine for measuring a response of the wake-up circuit for a second time period;

10 a routine for determining if the response is within a predetermined limit; and

a routine for recalibrating one of the voltage and the first time period if the response is not within the predetermined limit.

14. The computer program, as set forth in claim 13, wherein the tangible
15 medium is a memory.

15. The computer program, as set forth in claim 13, comprising a routine for accessing a plurality of stored parameters to determine the voltage and the first time period.

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16. The computer program, as set forth in claim 13, wherein recalibrating comprises updating one of the voltage and the first time period if the response is not within the predetermined limit.

17. The computer program, as set forth in claim 13, wherein the routine for applying the voltage is activated by the interrupt received at a processor.

5 18. The computer program, as set forth in claim 13, wherein the routine for applying the voltage to the wake-up circuit is utilized when a standby mode is indicated by a processor.

19. A method of monitoring a control system, the method comprising the acts of:

10 providing an interrupt signal to a microprocessor;

measuring a first voltage on a port of the microprocessor connected to a wake-up circuit;

generating an output voltage for a time period on the port;

15 measuring a second voltage on the port once the output voltage generation stops;

comparing the first voltage and second voltage to at least one stored parameter;

determining if the comparison is within or equal to a predetermined limit; and

recalibrating at least one of the output voltage and time period, if the

comparison exceeds the predetermined limit.

20 20. The method, as set forth in claim 19, comprising providing an interrupt signal to another port of the microprocessor connected to the wake-up circuit.

21. The method, as set forth in claim 19, wherein recalibrating comprises:
reducing the time period stored in memory, if the comparison is greater than the
predetermined limit; and
increasing the time period stored in memory, if the comparison is less than the
5 predetermined limit.

22. The method, as set forth in claim 19, wherein the acts are performed in
the order recited.

10 23. The method, as set forth in claim 19, wherein the predetermined limit is
stored in a memory coupled to the microprocessor.

24. The method, as set forth in claim 19, comprising recalibrating at least
one of the output voltage and the time period once a predetermined number of interrupts
15 have been performed.

25. A method of manufacturing a control system comprising the acts of:
providing a processor;
coupling a wake-up circuit to the processor;
20 encoding an program to:
provide a voltage to the wake-up circuit for a first time period if a
standby mode is indicated;
stop providing the voltage at the end of the first time period;

monitor a response of the wake-up circuit for a second time period; and
recalibrate the wake-up circuit if the response exceeds at least one of a
plurality of predetermined limitations.

5 26. The method, as set forth in claim 25, comprising coupling a memory to
the processor.

27. The method, as set forth in claim 26, comprising storing the encoded
program in the memory.

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28. The method, as set forth in claim 25, wherein coupling the wake-up
circuit comprises:
coupling a first resistor to a first port and a second port of the processor;
coupling a capacitor and a second resistor in parallel between the first port and
15 a lower voltage potential.

29. A method of monitoring a control system, the method comprising the
acts of:
providing an interrupt signal to a microprocessor;
20 operating the microprocessor to detect a state change for a control system
when the interrupt is provided;
determining whether a threshold event has occurred;

recalibrating at least one of a plurality of parameters associated with a wake-up
circuit to be within a predetermined limit, if the threshold event has
occurred; and
waiting for another interrupt to be provided to the microprocessor, if the
5 threshold event has not occurred.

30. The method, as set forth in claim 29, comprising accessing a switch
component to determine whether the state change has occurred.

10 31. The method, as set forth in claim 29, wherein the threshold event
comprises counting the number of times an interrupt has been provided to the
microprocessor connected to the wake-up circuit.

15 32. The method, as set forth in claim 29, wherein the threshold event
comprises measuring a time period from the previous calibration of the wake-up
circuit.